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OCT 7 1930

SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •

October 4, 1930

"With a Caricature of a Face"

Proboscis Monkeys, The Clowns of Their Kingdom

(See Page 220)

A SCIENCE SERVICE PUBLICATION

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SCIENCE NEWS LETTER

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The Weekly Summary of Current Science

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• DO YOU KNOW THAT •

Coconut trees may bend to touch the ground in a storm, without breaking.

The Vittoria, in which Magellan first sailed round the world was a ship of only 85 tons displacement.

Army draft records showed that Texas men averaged the tallest in the United States and Rhode Island men were shortest.

The Munich Zoological Gardens have two hybrid animals resulting from the crossing of a lion and a tigress and said to be the only such animals in existence.

When coffee was introduced into Europe as a novelty, it was said to be an effective remedy against colds, hysteria, and toothache.

Mayan Indians of British Honduras rarely bury their dead in coffins because of the belief that a dead man would have to carry the coffin as a burden to heaven.

Java gets more thunderstorms than any other country.

Dried ant eggs, imported from South America, are the chief food of newly-hatched quail and pheasants on some of the game-bird farms in the West.

Sheep were first brought to America by the Spaniards under Cornado.

Children under a year of age sometimes have emotions which cannot be detected by the keenest eyed mother but which can be recorded by delicate electrical instruments, recent experiments show.

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Science Service presents over the radio, an address

THE HIGH ATMOSPHERE AND RADIO

To be made by Dr. Edward O. Hulburt, physicist of the U. S. Research Laboratory, a prominent authority on radio and how it is transmitted from place to place.

FRIDAY, OCTOBER 10, AT 3:45 P. M., E. S. T.

Columbia Broadcasting System

Scale of Centimeters

SECOND SKULL OF SINANTHROPUS

To provide "most valuable clue yet unearthed for solving the mystery of early man"

ANTHROPOLOGY

Second "Peiping Man" Skull Found to be That of Young Man

Noted British Anthropologist Predicts Discoveries Will Throw Flood of Light on Nature of Primitive Brain

A SECOND skull of Sinanthropus has been recovered from material taken out of the limestone caves at Choukoutien, about 40 miles from Peiping, where the original "Peking Man" skull was discovered by a young Chinese geologist, W. C. Pei, last December.

The material containing the new specimen was removed from the site last October to the Geological Survey's cenozoic research laboratory, located in the Rockefeller Foundation Hospital at Peiping, and was carefully worked over under supervision of the laboratory's honorary director, Dr. Davidson Black, who reported the discovery to the Chinese Geological Survey.

First Was Skull of Girl

In July several uncrushed fragments of bone were revealed. When chiselled out of the hard matrix and piecd together these were found to represent the greater part of the vault and a portion of the base of a Sinanthropus skull which evidently belonged to a young adult male.

Dr. Black is now inclined to believe that the skull found last December was that of an adolescent girl, though he admits this is pure surmise based largely on the general shape of the forehead. The new specimen lacks the general pentagonal shape usually associated with female skulls.

According to Dr. Black, the second skull, though somewhat fragmentary, yields valuable information concerning certain parts, including the sphenoid and nasal bones, which were represented in the previous find. Compared with the latter it also presents slight but significant differences in shape and size which Dr. Black thinks may possibly be due to a difference in sex.

While the proportions of the two skulls are in general the same, there are some marked variations. In the new specimen, for instance, the frontal bulges are not so prominent nor is the average thickness of the skull so great as in the first.

A complete comparison of the two skulls will be made when the preparation of the first specimen has been completed. This will probably take a couple of months, Dr. Black indicated.

Just where the Peking man fits into the scale of human evolution is not yet entirely certain, so perhaps the second specimen will help answer this question. It is generally agreed that he lived considerably after the Java apeman, Pithecanthropus erectus, who probably walked the earth some half million years ago. Dr. Black, who first described the Chinese specimen, has expressed the opinion that it is older than the Neanderthal man, whose age is estimated at about 40,000 years. Dr. Hrdlicka, of the Smithsonian Institution, however, last spring announced his opinion that the Peking skull was very similar to the Neanderthal specimens, so that it would be about the same age.

Discoveries Unique

These fossils of Sinanthropus will provide the most valuable clue yet unearthed for solving the riddle of early man, Prof. G. Elliot Smith, noted British anthropologist, predicted last week in a lecture before the Chinese Geological Society. Prof. Smith is in Peiping at the invitation of the Chinese Government for the purpose of studying the Sinanthropus specimens.

Although the report on the cast of the braincase obtained from the second skull is not complete, Prof. Smith described the discoveries as unique in the whole history of anthropology and predicted that the evidence would throw a flood of light on the nature of the primitive brain.

What Prof. Smith's exact conclusions will be are eagerly awaited by the scientific world due to the controversy that is raging over the birthplace of mankind.

Science News Letter, October 4, 1930

MEDICINE

Ultra-Short Radio Waves Kill Poison of Diphtheria

ULTRA-RADIO waves, shorter than those commonly used to send messages, are able to weaken materially the potent poison elaborated by the diphtheria bacillus, Drs. Ralph R. Mellon, Waclaw T. Szymanowski and Robert Alan Hicks of the Western Pennsylvania Hospital Institute of Pathology here have reported to *Science*.

The wave length used was 1.9 meters. The effect of temperature was carefully ruled out by using special cooling devices and by careful control tests. The strength of the poison, or toxin as it is

called, was so weakened that after six hours' radiation, the amount of toxin that would kill an animal was only equal to half of one dose of the strength and amount used in skin testing for diphtheria.

This work is the modern proof of a discovery made thirty-five years ago by two French scientists, D'Arsonval and Charrin. They found that high frequency currents of 200,000 cycles per second diminished the strength of diphtheria toxin. The frequency in the modern work was 158,000,000 cycles per second. Both the Pittsburgh investigators and D'Arsonval found that the greatest action of the rays was obtained when a film of the toxin was exposed to the radiation. Possibility of using this irradiated toxin as an immunizing agent was suggested by D'Arsonval and is considered by the Pittsburgh men worth investigating further.

Science News Letter, October 4, 1930

ASTROPHYSICS

Ten Million Volts Light Sun Like Huge Electric Lamp

Annihilation of Matter as Source of Tremendous Power Forms Basis for New Theory of Naval Research Physicist

ELECTRICITY, under a pressure of ten million volts, about the same as that of a good lightning flash, is constantly flowing from inside the sun into outside space, and so "heats the solar atmosphere to incandescence in a manner precisely like the filament of an electric light is heated by the electricity flowing through it." This is the new and startling theory that has been developed by Dr. Ross Gunn, research physicist of the U. S. Naval Research Laboratory. Dr. Gunn has discussed these implications of his theory with a representative of Science Service. A full technical report of his conclusions will shortly appear in *The Physical Review*.

Dr. Gunn pointed out that the rotation of the sun is peculiar. Not only does its equator turn faster than regions near its poles, but the rotation of the same part varies by a few per cent over a period of about six years. A similar regular change occurs in the amount of light that the sun gives off.

Good Lightning Voltage

"My study of the electric and magnetic phenomena in the sun's atmosphere has led me to an explanation of these observed variations and given a great deal of valuable numerical information," Dr. Gunn stated. "I don't need to go into technical details, but the way that we have observed the sun to rotate requires us to believe that it is constantly throwing off large amounts of electricity. This current is so large that it wouldn't mean much to the layman for me to express it in numbers, but the sun is caused to glow by a voltage equivalent to a good lightning discharge, about ten million. It is this continually flowing current that heats up the sun like the filament of an electric light, so we might say that the sun acts like a gigantic electric light radiating its energy into space. It is the ultimate power house and stimulant of the solar system.

"We can also calculate the total power required to light the solar electric lamp. The entire wealth of our nation would buy enough electricity, at present rates, to light the sun for a millionth of a second. Yet the sun has been burning this way for at least a million years, and perhaps longer, so you might ask where the energy comes from.

"The latest researches seem to answer this question and it seems almost certain that the energy comes ultimately from the annihilation of matter. In the past few years physicists have come to believe that mass and energy are the same thing in different forms. Therefore, if processes take place in the sun which cause mass to vanish and light or electrical energy to appear, we need not be greatly surprised. This view is consistent with many other known astronomical facts. It is fairly certain that by means of some subatomic process the sun converts a million tons of its material into energy every second.

DR. ROSS GUNN

He thinks the solar atmosphere is heated to incandescence by electricity

"This loss of mass is very great, but it is small compared with the sun's total mass. It is estimated that not until a million years have elapsed will its size be appreciably affected. Therefore, it seems likely that the sun will continue to shine as it does now for a great many generations, unless some new phenomenon appears and upsets the domestic economy of the old Egyptian god!"

Science News Letter, October 4, 1930

CHEMISTRY

New Sulfur Soap Found to Destroy Machinists' Boils

DR. EMORY R. HAYHURST, professor of hygiene at Ohio State University, has reported to the American Chemical Society the discovery of a new kind of soap, containing colloidal sulfur, that may come into wide use.

From a new method of gas purification there is obtained a very fine grade of pure sulfur as a by-product, yielded as a product resembling a moderately moist clay. It was found that men working with the process who made use of the sulfur as a hand cleanser obtained beneficial results, so Dr. Hayhurst tried it as a soap made with an ordinary castile base.

He found that it produced no harmful effects but was definitely beneficial. Its use was tried in a machine shop where "machinists' boils" had been common for five years, and within a few months every workman was entirely free of the trouble.

Science News Letter, October 4, 1930

ENGINEERING

Claude's Ocean Power Plant Connected to Deep Sea Pipe

Experiments Should Show Whether Criticism Made by Engineers of Practicability of New Method is Justified

By PROF. GEORGES CLAUDE

Matanzas, Cuba.—Our third tube was made in two months by Daime, launched by Vazquez, and sunk by me the seventh of September. The submarine connection was only completed on Monday, September 15, on account of the roughness of the sea. With it have now obtained a rate of 4,000 cubic meters per hour of water at 13 degrees Centigrade (56 degrees Fahrenheit) against 10½ degrees (52 degrees Fahrenheit) corresponding to a depth of 650 meters. Except that the warming is a little too extreme we are well satisfied.

THIS IS the dramatic description Prof. Georges Claude gives in a special cable to Science Service of the success of his third attempt to harness the cold waters of the sea bottom for operating a power plant. The whole big pipe was assembled on land, and laid like a gigantic snake on a narrow-gage railway track from which it was to be pulled into the water.

A series of floats held the end of the tube in place for the divers to insert the final segment near shores. Another series of floats steadied the pipe at the point where it drops sharply down into deep water. M. Claude's son, with two trusted workmen, were successful in launching the big tube, where a crew of sixty or more excitable Cubans failed earlier in the summer. The tube is made of corrugated steel five feet, eight inches in diameter, and 2000 yards in length.

New Plant for Commercial Use

M. Claude explained to a Science Service writer who visited Matanzas that the present plant will never be used for the production of commercial power. It is, in fact, the same 50 kilowatt plant which he used at Ougrée in Belgium, to conduct experiments of a similar nature on the Meuse River. After experiments are completed in Matanzas, the whole plant will be abandoned and M. Claude will build another plant for further experiments elsewhere in Cuba.

Although some engineers have criticized the Frenchman's novel apparatus as being impractical and point to serious difficulties to be overcome, they admit that his theory is sound.

The apparatus resembles closely the usual steam power plant that uses a fire to make its steam. But in the plant at Matanzas, there is no place for a fire. The highest temperature of any of the apparatus will be that of the incoming water from the surface of the ocean at about 80 degrees Fahrenheit. This enters the boiler or steam generator after passing through a de-gassing tank which removes the dissolved atmosphere and gases.

Water which comes from deep in the ocean and is 30 degrees cooler than that which enters the generator is brought to the condenser at the other end of the sysetm. As in the ordinary steam power plant, it is used to condense the steam after it has passed from the generator through the turbine. This continuous process of condensation lowers the pressure in the boiler and causes more water to evaporate into steam and flow through the turbine into the condenser, to be changed into water again.

Pressure in the usual steam boiler is measured in hundreds of pounds, while that in the Claude boiler will be less than the pressure of the atmosphere outside. Even this low pressure of the boiler will be higher than that of the condenser, because the steam must flow from the boiler through the turbine to the condenser in order to turn the blades of the turbine and produce power.

And this is where engineers accustomed to conventional power plants direct most of their criticism. Because the process involves relatively small changes of temperature and pressure, unusually large quantities of cool condensing water and warmer boiler water will be required. Will not a prohibitive amount of auxiliary power be required to pump this water? it is asked.

How Large Must It Be?

Also, because of the slight pressure differences on which the turbine operates, large quantities of steam must pass through it to produce a reasonable amount of power and the turbine will have to be unusually large to take care of this steam.

On the other hand, M. Claude's record of achieving what others have called impossible should not be overlooked. He invented the first successful process for making liquid air and for liquefying other gases; he pioneered in the field of making liquid ammonia out of the atmosphere; and he is the inventor of glowing red neon lights that shine on our streets at night.

Science News Letter, October 4, 1930

STEAM AT ORDINARY TEMPERATURES

Comes from this plant. Left to right—turbine, steam generator and de-gasser

ASTRONOMY

October To Bring Far Away Eclipses of Sun and Moon

American Expedition Sets Up on Lonely Pacific Island While Amateurs at Home Enjoy Local Skies

By JAMES STOKLEY

THE YEAR'S second eclipse of the sun is the most important astronomical event of the month of October. But it will be quite different from its immediate predecessor. That one, on April 28, was visible in its partial phases over practically all of North America, while the total phase, which was just barely total and lasted only for a second or so, was seen along a narrow line from California to Montana.

October 21 brings eclipse number two, but to see even the partial phase, in which the moon covers only part of the sun, leaving a crescent of light still visible, you would have to travel to New Zealand, Australia, New Guinea or the southern tip of South America.

The narrow path of totality, about twenty miles wide at the beginning and end, and fifty miles wide at the middle, stretches for nearly 7000 miles in a southeasterly direction across the south Pacific. The eastern end just reaches southern Chile, where the total eclipse will be visible, weather permitting, just as the sun is setting. Because of its lateness in the day, Chile will not be a favorable observation point. Astronomers want to get near the middle of the path, where the eclipse occurs near noon, when the sun is high in the heavens.

Only Two Islands in Path

These conditions are met by only two bits of land in the great areas of water. The first is Nurakita, a swampy coral island in the Gilbert group. It is uninhabited and almost impossible to reach. The second island is only a little better. It is Niuafou, in the Tonga group, nearly six square miles in extent and with about 1100 inhabitants, mostly natives.

Two groups of astronomers have already gone to the rocky shores of Niuafou. One group is from New Zealand.

An American expedition, sponsored by the U. S. Naval Observatory, has established its station at Niuafou. In charge of the scientific party is Dr. S. A. Mitchell, director of the Leander McCormick Observatory of the University of Virginia, and veteran of seven previous eclipses.

Chief of the American instruments is a 63-foot long camera with which large scale photographs will be made of the corona, the sun's outer layer, visible only at an eclipse. This will be operated by Dr. Ross W. Marriott of the Sproul Observatory of Swarthmore College.

Dr. Mitchell himself is mainly interested in observations with the spectroscope, especially of the flash spectrum. This is the outermost layer of the sun ordinarily visible. Except at an eclipse, the light of this layer is completely mixed with the light from the inner parts of the sun, but at the beginning and end of totality, for an instant just before or just after the moon completely covers the sun, this layer shines by its own light. Then only it can be analyzed with the spectroscope, greatly increasing our knowledge of the sun.

Still other cameras will make photographs of the stars around the eclipsed sun, as a further test of the deflection of starlight as it passes the sun. This effect was predicted by Einstein's theory of relativity. Though it was first measured at an eclipse in Brazil in 1919, and was later verified by American observers of an eclipse in Australia in 1922, still further observations of it will be helpful.

The crucial day is Wednesday, the twenty-second. At 7:58 in the morning, according to the time in use there, the eclipse will begin, and the moon will start to encroach upon the solar disc.

At 9 hours 10 minutes 54.06 seconds, according to the predictions of the U. S. Nautical Almanac Office, the total phase will start. Then the sun will be completely covered by the moon, and the wings of light that we call the corona will appear beyond the black lunar disc. Perhaps a few bright red prominences, huge flames of hydrogen, will appear above the sun's surface.

Work To The Second

As soon as the total eclipse starts, one member of the party, stationed at a chronometer, will start calling seconds. Every exposure of the cameras, in fact every single movement made during the 92 seconds of totality, has been planned in advance, and must be made on time to the second. At 12 minutes 26.10 seconds after nine the bright disc of the sun will again shine out as a narrow crescent and the total eclipse will be over. But not until 10:34 will the moon completely leave the sun.

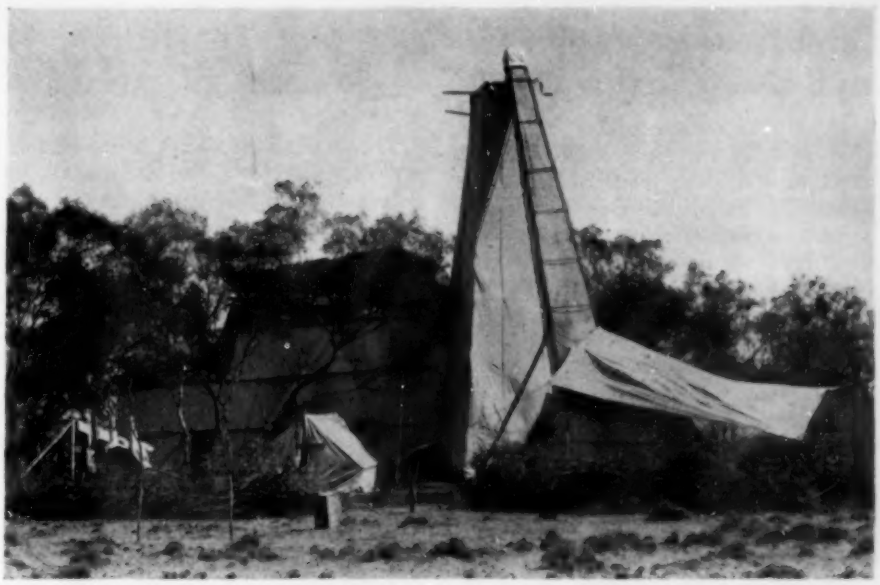
All this takes place on the morning of Wednesday, the twenty-second, for the astronomers at Niuafou. That is, it will take place if it is clear. But while it is going on it will be the afternoon of Tuesday, the twenty-first, for Americans. The 92 seconds of total eclipse begins at 3:51 p. m., eastern standard time.

THE SOUTHERN SKIES IN OCTOBER

Another curious circumstance about this eclipse is that it ends before it starts. It starts on the west side of the international date line, which follows approximately the meridian of 180 degrees longitude, and ends on the east side. When the moon's shadow first touches earth north of New Guinea, it is sunrise there, on Wednesday morning. Niuafou is to the west of the date line, so there it is still Wednesday morning. But soon after it passes Niuafou it crosses the date line, and then the eclipse suddenly starts occurring on Tuesday morning. A little farther on it is Tuesday afternoon, and when the shadow leaves the earth at southern Chile it does so at sunset on Tuesday, the evening before it started!

This eclipse of the sun is not the only eclipse occurring in October, however. The sun eclipse happens when the moon, in its wanderings, passes between the sun and earth, in other words, when it is new. Just two weeks before this, on the seventh, the moon is one-half of an orbital revolution away from that place, and then it is in such a position that the earth comes partly between it and the sun. Then the moon comes into the shadow of the earth, and is darkened. At that time, as always at the time of a lunar eclipse, the moon is full. But this partial eclipse of the moon will not be visible from any part of North or South America and even where visible it will not be conspicuous.

Though the most striking astronomical features of October are not visible in the United States, the night sky for Americans will not be entirely without interest. The planet Venus still continues to be the brightest object in the night sky, except the moon, of course. For some months Venus has been gradually increasing in brightness and on the 18th of October it reaches its maximum brilliance. Then it is of the minus 4.3 magnitude, so that it is just about five magnitudes brighter than the star Altair, in Aquila, the eagle, the bright star which shines above it and to the right. A difference of five magnitudes means that Venus is a hundred times brighter than Altair.



READY FOR AN ECLIPSE

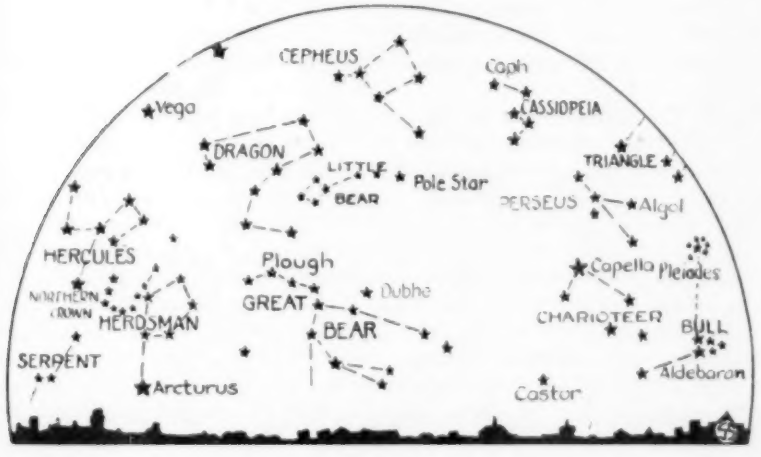
The astronomers' apparatus on Niuafou Island when ready for observing the October eclipse will resemble this set-up. On the right is a 40-foot telescope and a shelter for Einstein cameras, and in the central background and on the left is a polar axis carrying a camera and spectrographs. It is the Crocker Eclipse Expedition from the Lick Observatory to Australia in 1922.

Saturn, also, is still visible in the evening sky, but it is not well placed either. It is directly south a little before five o'clock, local time, so that by the time it gets dark it is well to the southwest. It sets about four hours after the sun.

Later in the night Jupiter can be seen. About eleven o'clock it rises, in the constellation of the twins, Gemini. About six o'clock in the morning it is directly south. Rising soon after Jupiter, in the next-door constellation of Cancer, the crab, is Mars, red in color and about one-tenth as bright as Jupiter.

Vega, in the constellation of Lyra, the lyre, seen high in the western sky, is the brightest star visible in the October evening sky. Almost above it is Deneb, in Cygnus, the swan, sometimes called the Northern Cross. South of Vega is Altair, in Aquila, the eagle. Low in the eastern sky, in Taurus, the bull, is seen Aldebaran, distinguished by its reddish color. In the northeast, in Auriga, the charioteer, is seen Capella, which is exceeded only by Vega in brightness among the stars now visible. The sixth first-magnitude star to be seen this month in the evening is Fomalhaut, in Piscis Austrinus, the southern fish. This star is low in the south about nine o'clock.

Though not as bright as the stars mentioned, a characteristic feature of the evening sky at present is the "great square of Pegasus" high in the southern sky. Four stars of similar brightness mark the corners of the square. The three to the south and west are in the constellation of Pegasus, the winged horse, though the northeastern one is in Andromeda, the chained lady.



THE NORTHERN SKIES IN OCTOBER

CHRONOLOGY

Celebrations for Virgil Held One Year Too Early

MANY celebrations have been held in Italy this year of the 2000th anniversary of the birth of the great Latin poet Virgil, but they have really been held a year too early. Dr. Pio Emanuelli, astronomer at the Vatican Observatory, has pointed out that the actual bimillenary comes next year, in 1931.

The reason for this is that there was never a zero year. The year 1, A.D. immediately followed the year 1, B.C. Therefore an event that took place in 5 B.C., for example, would have its tenth anniversary in 6 A.D. The first anniversary would be in 4 B.C., the second in 3 B.C., the third in 2 B.C., the fourth in 1 B.C., the fifth in 1 A.D., the sixth in 2 A.D., the seventh in 3 A.D., the eighth in 4 A.D., the ninth in 5 A.D., and the tenth in 6 A.D. Simply subtracting the years B.C. from the anniversary desired, which would seem at first sight to be the correct method of finding it, would give the incorrect result of 5 A.D. for the tenth anniversary.

The date of Virgil's birth is taken as 70 B.C., and subtracting this from 2000 gives 1930. But one year must be added to make up for the lack of a zero year, and so the actual two thousandth anniversary will occur next year, whether it is celebrated or not.

Science News Letter, October 4, 1930

CHEMISTRY—ENGINEERING

Latest Disaster May Reveal New Facts on Exploding Dust

THE FIFTH and most severe of five dust explosions that have occurred in a month is now being investigated by the U. S. Department of Agriculture. David J. Price, engineer in charge of grain dust explosion work in the department's bureau of chemistry, has been sent to Decatur, Ill., to study at first hand the disastrous explosion which occurred there on Saturday, Sept. 20, in a starch plant.

Just before departing, Mr. Price told Science Service that the plant in which the explosion occurred was a very modern one, and was considered to be one of the most progressive in the practice of methods for the prevention of explosions. Yet an explosion occurred, with five deaths resulting and two more injuries that were expected to be fatal. Because the explosion occurred despite all precautions, Mr. Price thinks that the study of its effects may reveal some hitherto unknown facts about dust explosions.

The first of the recent series of dust explosions occurred on August 20, in Baltimore, when a grain elevator was demolished with five deaths. This, also, was a very modern plant, in which all recommended precautions were taken. The next two were cattle feed plants, in Kansas City and Minnesota, with three and two deaths each. Then occurred one in a tobacco plant in Richmond, which, fortunately, resulted in no loss of life. Mr. Price stated that this was one of the first explosions of tobacco dust, which is not ordinarily as hazardous as dust of other kinds, such as grain.

Dust becomes explosive when floating in the air, so that each particle has a plentiful supply of oxygen to enable it to burn rapidly. The same dust, if in a pile, might not burn, and might even extinguish a match plunged into it.

Science News Letter, October 4, 1930

ASTRONOMY

Tempel's Second Comet on Regular Visit to Earth

TEMPEL'S second comet, last seen on its visit in the summer of 1925, has again returned to the neighborhood of the earth. Prof. George Van Biesbroeck, of the Yerkes Observatory at Williams Bay, Wisconsin, picked it up on the evening of Sunday, September 21, Dr. Edwin B. Frost, director of the observatory, has announced. The comet was within approximately the diameter of the full moon of the place predicted for it by Dr. A. C. D. Crommelin, famous English authority on cometary orbits. Dr. Crommelin made his prediction of the location of the planet about a year ago.

When Dr. Van Biesbroeck picked it up, it was close to the boundary between the constellations of Scorpio and Ophiuchus.

Tempel was a European astronomer who first discovered this comet in 1873. Since then it has been observed on seven returns, including the present one, and it comes back once in about five and a fifth years. It never becomes bright enough to be seen with the naked eye. At present it is of about the twelfth magnitude, visible only through large telescopes.

Science News Letter, October 4, 1930

IN SCIENCE

AVIATION—METEOROLOGY

Greatest Darkness Brought By Smoke After Dawn

SO FAR AS visibility over a distance is concerned, the greatest darkness of the day comes after dawn, not just before, as the old adage has it, according to a report made to the U. S. Weather Bureau by F. H. Weck, based on studies made during the first quarter of 1930 at the Chicago airport. At 4 A. M., in March, it was possible to see horizontally for a distance of eight miles, but a little after 7 A. M., it was cut down to three and a half miles, he found. He ascribes this condition to the stoking of household furnaces after the man of the house arises, thus increasing the amount of smoke coming from them.

As the day advances, the visibility increases, and drops again in the late afternoon, as household furnaces are fired again, and factory fires banked for the night. That the difference is due mainly to smoke, which in turn depends on the amount of coal consumed, is shown, Mr. Weck said, by the fact that the average visibility was better for the month of March than for the month of January.

Science News Letter, October 4, 1930

EDUCATION—BIOLOGY

Drawing Found Not Helpful To Students of Science

THE DRAWING of specimens in laboratory notebook, a time-honored method of impressing the structure of plants and animals upon the mind of the students taking courses in elementary biology, has been tried and found wanting by Lourene Taylor, instructor in plant biology at the University of Oregon.

The trial was made on 178 students, 91 of whom made their own drawings. For the others ready-made drawings were provided which the student had merely to label correctly. It was found that the students who did not draw got along a little better on the average than those who labored with the original drawings.

Science News Letter, October 4, 1930

ENCE FIELDS

SEISMOLOGY

Study Toy Houses Shaken By Synthetic Earthquakes

SYNTHETIC earthquakes, manufactured in a small steel platform and allowed to act on model houses and buildings built in the Stanford University, California, engineering school, are teaching engineers how to build the structures which will withstand the severe shakings of the earth that occur sometimes in California and other parts of the world. Prof. Lydik Jacobsen, of Stanford, has reported to the National Academy of Sciences his researches upon the horizontal part of the earth shaking. The small size houses are shaken in various ways by being placed on the platform mounted on wheels.

Science News Letter, October 4, 1930

MEDICINE

Study Shows Tonsil Removal Is Not a Sure Protection

REMOVAL of the tonsils does not not give a child sure protection against many or in fact any of the usual health hazards of childhood, Dr. Albert D. Kaiser of Rochester, N. Y., has reported to the American Medical Association. Dr. Kaiser's report is based on a study of over 4,000 Rochester school children.

Removing a child's tonsils and adenoids has become so common a procedure that approximately half the older children of American cities have had this done, Dr. Kaiser estimated. The operation is commonly performed in the hope of relieving or preventing great variety of conditions. Actually it benefits some but not all of them, Dr. Kaiser's studies showed.

Sore throats were impressively fewer in the children whose tonsils had been removed. Likewise fewer of these children had scarlet fever, diphtheria and inflammation of the glands of the neck.

Acute head colds and inflammation of the inner ear were appreciably reduced during the first three years following removal of the tonsils, but were not much affected during a ten-year follow-up period.

Laryngitis, bronchitis and pneumonia not only were not benefited by removal of tonsils but actually occurred more frequently in children whose tonsils were removed.

These children were less likely to get a first attack of rheumatic fever, St. Vitus' Dance, growing pains or rheumatic heart trouble, but removing the tonsils did not seem to help recurrent attacks of these conditions. The children whose tonsils were removed at an early age were least likely to have these diseases.

Science News Letter, October 4, 1930

GENERAL JOHN J. CARTY

GENERAL SCIENCE

Science Award in Honor of General John J. Carty

A NEW honor and award that will be given to leading scientists of the future was established through the acceptance by the National Academy of Sciences of a trust fund of $25,000 presented by a group of officials of the American Telephone and Telegraph Company in honor of General John J. Carty, who recently retired from active connection with the scientific research of that organization.

The John J. Carty Medal and Award for the Advancement of Science which will be supported by this fund may be "either for specific accomplishment in some field of science or for general service in the advancement of fundamental and applied science."

The donors of the fund explain that the award was established as a testimonial to General Carty's "noteworthy contributions to the advancement of fundamental and applied science and in appreciation of his great service for many years in developing the art of electrical communication."

Science News Letter, October 4, 1930

METEOROLOGY

100 Lightning Flashes Per Second Causes Static

Radio static is due entirely to lightning flashes, in the opinion of physicists attending the recent meeting of the British Association for the Advancement of Science held at Bristol. This idea disagrees with opinions of scientists elsewhere, notably in France, but Sir Ernest Rutherford and Sir Oliver Lodge, deans of British physics, backed up the opinions of their younger contemporaries.

Approximately a hundred lightning flashes per second occur throughout the world and the British studies show that atmospherics or static also occur at the rate of a hundred a second. Instruments have been devised to record the distance, direction, intensity, and waveform of each atmospheric.

It is expected that this work will prove of advantage to aircraft as it will allow the location of distant storms that might endanger air transportation.

Science News Letter, October 4, 1930

EDUCATION

High Schools to Get Books For Best Scientific Essays

DECISION to offer $1,800 worth of books to high schools submitting the best essays on scientific subjects by students has been made by a special committee of the American Association for the Advancement of Science. The date for final submission of essays has been set for March 15, 1931.

Early notification from schools interested in entering students in the essay contest is requested by the executive committee, headed by Dr. Otis W. Caldwell, with offices at 433 West 123d Street, New York City.

Among the list of forty-four proposed subjects for the essay writing are: "How has science changed my everyday life?"; "What great inventions not yet made are needed in the modern world?"; "My greatest teacher and why (not limited to science)"; and "My own scientific experiments, why I made them and what I gained from them."

If the student essays show sufficient merit, it is proposed that they shall be brought out in book form. Besides the prizes to the twenty schools which will divide the $1,800 in books among them, the committee expects to award winning students with "Recognitions of Achievement," if the essays are worthy.

Science News Letter, October 4, 1930

MATHEMATICS-MECHANICS

"A Classic of Science"—
The Difference Engine

CHARLES BABBAGE, the famous British Mathematician, tells how, when only about 20 years old, he planned the most complicated calculating machine ever designed:

"ONE evening I was sitting in the rooms of the Analytical Society, at Cambridge, my head leaning forward on the table in a kind of dreamy mood, with a table of logarithms lying open before me. Another member, coming into the room, and seeing me half asleep, called out, 'Well, Babbage, what are you dreaming about?' to which I replied, 'I am thinking that all these tables (pointing to the logarithms) might be calculated by machinery'."

The first machine which Babbage invented computed tables of related figures by adding or substracting the differences between the numbers, and was hence called the Difference Engine. An even more complex machine, the Analytical Engine, was projected. It was to solve algebraic problems by amechanism operated by perforated cards, like a jacquard loom or a modern self-playing piano. After spending his life and fortune on the plans and models of his machines, Babbage suffered the usual heartbreak of the inventor who is ahead of his times.

The Classic here reprinted gives Babbage's idea of what should be expected of a calculating machine.

THE EXPOSITION OF 1851; or, Views of the Industry, the Science, and the Government, of England. By Charles Babbage, Esq., London.

I HAVE met in the course of my inquiries with four cases of obstacles presenting the appearance of impossibilities. As these form a very interesting chapter in the history of the human mind, and are on the one hand connected with some of the simplest elements of mechanism, and on the other with some of the highest principles of philosophy, I shall endeavour to explain them in a short, and, I hope, somewhat popular manner, to those who have a very moderate share of mathematical knowledge. Those of my readers to whom they may not be sufficiently interesting, will, I hope, excuse the interruption, and pass on to the succeeding chapters.

The first difficulty arose at an early stage of the Analytical Engine. The mechanism necessary to add one number to another, if the carriage of the tens be neglected, is very simple. Various modes had been devised and drawings of about a dozen contrivances for carrying the tens had been made. The same general principle pervaded all of them. Each figure wheel when receiving addition, in the act of passing from nine to ten caused a lever to be put aside. An axis with arms arranged spirally upon it then revolved, and commencing with the lowest figure replaced successively those levers which might have been put aside during the addition. This replacing action upon the levers caused unity to be added to the figure wheel next above. The numerical example below will illustrate the process.

597,999 201,001	Numbers to be added.
798,990	Sum without any carriage.
1	Puts aside lever acting on tens.
798,900	First spiral arms adds tens and
1	puts aside the next lever.
798,000	Second spiral arm adds hun-
1	dreds, and puts aside the
	next lever.
799,000	Third spiral arm adds thou-
	sands.

Now there is in this mechanism a certain analogy with the act of memory. The lever thrust aside by the passage of the tens, is the equivalent of the note of an event made in the memory, whilst the spiral arm, acting at an after time upon the lever put aside, in some measure resembles the endeavours made to recollect a fact.

It will be observed that in these modes of *carrying*, the action must be *successive*. Supposing a number to consist of thirty places of figures, each of which is a nine, then if any other number of thirty figures be added to it, since the addition of each figure to the corresponding one takes place at the same time, the whole addition will only occupy nine units of time. But since the number added may be unity, the carriages may possibly amount to twenty-nine. Consequently the time of making the carriages may be more than three times as long as that required for addition.

The time thus occupied was, it is true, very considerably shortened in the Difference Engine: but when the Analytical Engine was to be contrived, it became essentially necessary to diminish it still further. After much time fruitlessly expended in many contrivances and drawings, a very different principle, which seemed indeed at first to be impossible, suggested itself.

Carrying Tens

It is evident that whenever a carriage is conveyed to the figure above, if that figure happen to be a nine, a new carriage must then take place, and so on as far as the nines extend. Now the principle sought to be expressed in mechanism amounted to this.

1st. That a lever should be put aside, as before, on the passage of a figure-wheel from nine to ten.

2d. That the engine should then ascertain the position of all those nines which by carriage would ultimately become zero, and give notice of new carriages; that, foreseeing those events, it should anticipate the result by making all the carriages simultaneously.

This was ultimately accomplished,

Next Week's

CLASSIC OF SCIENCE

JEAN BAPTISTE JOSEPH FOURIER

Famous French mathematician and scientist and able engineer to Napoleon in Egypt on

THE THEORY OF HEAT

and many different mechanical contrivances fulfilling these conditions were drawn. The former part of this mechanism bears an analogy to memory, the latter to foresight. The apparatus remembers as it were one set of events, the transits from nine to ten: examines what nines are found in certain critical places: then, in consequence of the concurrence of these events, acts at once so as to anticipate other actions that would have happened at a more distant period, had less artificial means been used.

The second apparent impossibility seemed to present far greater difficulty. Fortunately it was not one of immediate *practical* importance, although as a question of philosophical inquiry it possessed the highest interest. I had frequently discussed with Mrs. Somerville and my highly gifted friend the late Professor M'Cullagh, of Dublin, the question whether it was possible that we should be able to treat algebraic formulæ by means of machinery. The result of many inquiries led to the conclusion, that if not really impossible, it was almost hopeless. . . .

This is not a fit place to enter into the detail of the means employed, further than to observe, that it was found possible to evade the difficulty, by connecting *indefinite* number with the *infinite in time* instead of with the *infinite in space*.

The solution of this difficulty being found, and the discovery of another principle having been made, namely—that *the nature of a function might be indicated by its position*—algebra, in all its most abstract forms, was placed completely within the reach of mechanism.

Uses Logarithms

The third difficulty that presented itself was one which I had long before anticipated. It was proposed to me nearly at the same time by three of the most eminent cultivators of analysis then existing, M. Jacobi, M. Bessel, and Professor M'Cullagh, who were examining the drawings of the Analytical Engine. The question they proposed was this:—How would the Analytical Engine be able to treat calculations in which the use of tables of logarithms, sines, &c. or any other tabular numbers would be required?

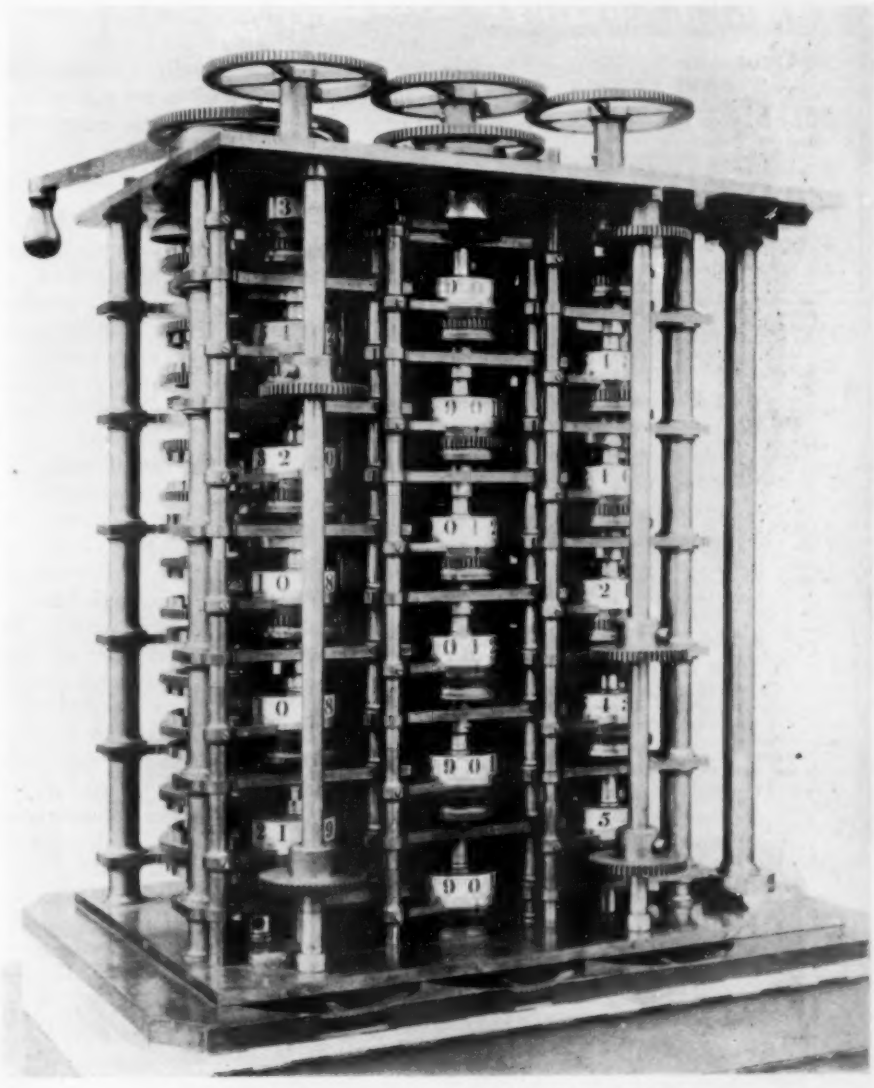
My reply was, that as at the time logarithms were invented, it became necessary to remodel the whole of the formulæ of Trigonometry, in order to adapt it to the new instrument of calculation: so when the Analytical Engine is made, it will be desirable to transform all formulæ containing tabular numbers into others better adapted to the use of such a machine. This, I replied, is the answer I give to you as mathematicians; but I added, that for others less skilled in our science, I had another answer: namely—

Asks for What It Wants

That the engine might be so arranged that wherever tabular numbers of any kind, occurred in a formula given it to compute, it would on arriving at any required tabular number, as for instance, if it required the logarithm of 1207, stop itself, and ring a bell to call the attendant, who would find written at a certain part of the machine, "Wanted log. of 1207." The attendant would then fetch from tables previously computed by the engine, the logarithm it required, and placing it in the proper place, would lift a detent, permitting the engine to continue its work.

The next step of the machine, on receiving the tabular number (in this case the logarithm of 1207) would be to *verify* the fact of its being really that logarithm. In case no mistake had been made by the attendant, the engine would use the given tabular number, and go on with its work until some other tabular number were required, when the same process would be repeated. If, however, any mistake had been made by the attendant, and a wrong logarithm had been accidentally given to the engine, it would have discovered the mistake, and have rung a louder bell to call the attention of its guide, who on looking at the proper place, would see a plate above the logarithm he had just put in with the word *"wrong"* engraved upon it.

By such means it would be perfectly



A FRAGMENT OF THE DIFFERENCE ENGINE

The Only Part Actually Built. It is in the South Kensington Museum, London

possible to make all calculations requiring tabular numbers, without the chance of error.

Although such a plan does not seem absolutely impossible, it has always excited, in those informed of it for the first time, the greatest surprise. How, it has been often asked, does it happen if the engine knows when the *wrong* logarithm is offered to it, that it does not also know the right one; and if so, what is the necessity of having recourse to the attendant to supply it? The solution of this difficulty is accomplished by the very simplest means.

Science News Letter, October 4, 1930

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PHYSICS-METEOROLOGY

Cosmic Rays Excel Barometer As Indicator of Overhead Air

Dr. Millikan Made a Thorough Check of New Findings Before Presenting Them to National Academy of Sciences

A PRACTICAL use for the cosmic rays that bombard the earth from outer space with amazing penetration and shortness of wave length has been discovered by Dr. Robert A. Millikan, Nobel prize physicist and president of the California Institute of Technology and who, only a few years ago, began to study these rays intensively.

He has discovered within the last few weeks that the instrument used for measuring the cosmic radiation, called an electroscope, as perfected for his present researches, will measure the depth of air overhead at any part of the earth with an accuracy far surpassing that given by the familiar meteorological instrument known as the barometer.

Uses Cosmic Ray Electroscope

The cosmic ray electroscope he has reported to the National Academy of Sciences, "can furnish us with new data about what is happening in the upper air and must assist in the important problem of predicting, if not controlling, meteorological and geophysical events."

Dr. Millikan made his discovery of everyday utilization of this hitherto research instrument during the course of an expedition to within seven hundred miles of the North Pole and two hundred miles of the north magetic pole.

Carrying five hundred pounds of scientific instruments and slabs of lead with which to shield them from earthly radiations, Dr. Millikan traveled over the new train-a-week railroad to Fort Churchill in Canada on the west side of Hudson Bay. There he set up his electroscope and made observations night and day for a week. He returned from this trip two weeks ago.

He desired observations close to the magnetic pole in order to test the theories of physicists, with whom he disagreed, who held that the cosmic rays were not waves in the ether like light, heat and X-rays, but high-speed electrons. Professor P. S. Epstein, one of Dr. Millikan's colleagues, explained that mathematical theory shows that if the penetrating cosmic radiations were high-speed electrons they should be deflected in the magnetic field of the earth and therefore be much more plentiful near the magnetic poles.

The observations show that the cosmic radiation is an ether wave radiation that comes to the earth with constant and uniform intensity at all latitudes. Observed variations in it are due to changes in the thickness of the shielding air through which they must pass to reach the surface. This fact allows Dr. Millikan to propose that the electrometer be used as an instrumental mate to the barometer in every weather bureau station.

Dr. Millikan reaffirmed his belief that cosmic rays are signals from the depths of space of the continuous formation there of the common abundant elements helium, oxygen, silicon and iron out of hydrogen.

This is hopeful reassurance to those who have felt that the whole universe is like a great watch running down. There is evidence in the stars and nebulæ that matter is being changed into light and therefore dissipated to the ends of the universe. Dr. Millikan's view indicates that somewhere there may be a rebuilding of matter in progress.

Science News Letter, October 4, 1930

ZOOLOGY

Borneo Monkeys Imitate Men With Both Nose and Voice

ONE of Nature's most striking living caricatures is the proboscis monkey which lives in the deep forests of Borneo. A group of these creatures shown as they appear in their home among the branches of a pongyet tree is on exhibition in Carl E. Akeley Memorial Hall at Field Museum of Natural History.

The proboscis monkey gets its name from its very prominent and peculiarly shaped long nose, which gives its face almost the exact appearance of certain types of low comedians who appear on the stage with false noses. Its other

features are exceedingly human-like.

The monkey is a distinct species found only in Borneo. It grows to quite large size, and has brightly-colored hair. In the young the nose is much less prominent, attaining its full development and grotesqueness only in the adult animals. These monkeys frequent the tops of lofty native trees, and are often seen gathered in small troupes, sitting in the sunlight where there are breaks in the density of the forests overlooking the banks of rivers.

The comedy aspect of the monkeys is carried out also in their voices. They utter long-drawn-out resonant cries resembling the deep tones of a bass viol in the hands of an extremely poor player. Among the natives of Borneo the monkeys are called "blanda" and "rasong." They are at home in the water, and often swim wide stretches of river.

In the museum group, which is a gift from Martin A. Ryerson, are four fully grown males, two females, and one young monkey.

Science News Letter, October 4, 1930

MEDICINE

Newly Found Substance Promises to Cure Pneumonia

A NEWLY discovered substance which promises to give protection against pneumonia and to cure the disease has just been reported to *Science* by Drs. Oswald T. Avery and Rene Dubos of the Hospital of the Rockefeller Institute for Medical Research in New York City. The new substance is probably an enzyme. It attacks the outer coating of a pneumonia germ.

The pneumonia germ's ability to invade the tissues of the body depends partly on this outer coating or capsule. Pneumonia germs, scientifically called pneumococci, are of three types, each type having a specific kind of sugar in its capsule. The sugar of the Type III pneumococcus can be split up into simpler compounds by the new enzyme, the Rockefeller investigators discovered.

This change in the composition of the germ's invading weapon should make a difference in the germ's effect on the body, they reasoned. Experiments with mice bore out this theory.

From the cranberry bogs of New Jersey comes this new weapon against pneumonia. The organic matter of the soil in the bogs yielded a bacillus from which the enzyme was extracted. This enzyme is effective only against the Type III pneumococci, and its protective value is destroyed by heating.

Science News Letter, October 4, 1930

Visual Instruction Made Easy . . .

A new instrument, the Overhead Projector, enables an instructor to sit at his desk facing his audience and operate his own machine. It projects the pictures upon a screen overhead, in full view of everyone. Furthermore, the operator sees the pictures exactly as does the audience, since the slides are inserted right side up in front of him. He can point with a pencil to features on the slide which he desires to stress instead of having to stand beside the screen with a pointer. Changing slides is extremely simple and can be done while talking.

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MEDICINE

Tuberculosis Germs Are in Bodies of All Civilized People

Their Attack is Successful, As It Was With the President's Son, When the Body is in a Weakened Condition

ANNOUNCEMENT that the President's son, Herbert Hoover, Jr., is suffering from tuberculosis, will surprise many people. Tuberculosis, however, is no respecter of persons and anyone, old or young, rich or poor, fat or thin, strong or weak, city dweller or countryman, may get it.

As a matter of fact, nearly all grown persons in civilized countries have the germs of tuberculosis in their bodies. When your resistance is weakened because of overwork, as in the case of the President's son, or because of pneumonia, influenza, grippe, continuous loss of sleep or some other cause, the germs in your body attack you and the disease develops.

The cure of tuberculosis depends chiefly on early recognition and on faithful adherence to treatment. The most important factor in the treatment is rest, which must be taken in bed.

The tuberculosis germs may attack any part of the body, but they most frequently attack the lungs. Our lungs must work with every breath we draw, so rest for them is relative. When we are exercising, or moving about in any way, we are giving our lungs more work to do. Their work is easiest when we are asleep or lying quietly in bed. So for tuberculosis of the lungs, absolute rest in bed is necessary to give the lungs their chance to fight off the disease.

Early Signs of Disease

Most people think cough, hemorrhage or spitting of blood, and wasting fever are the only signs of tuberculosis. These are late signs of the disease. Early signs are weakness and a tired feeling. Irritability is another of the early symptoms. So are loss of appetite and disturbance of digestion. Pain in the chest or in the back between the shoulder blades or in the shoulder is another early symptom, which is sometimes mistaken for rheumatism.

Tuberculosis is no longer the menace in this country that it once was when it earned the name of white plague. The death rate from this disease has decreased more than one-half since 1900. Statisticians estimate that in 50 years more tuberculosis in America will be almost eradicated.

For the individual who recognizes the symptoms of tuberculosis early, promptly consults a competent doctor and follows his directions, the outlook is distinctly good. The length of time required for recovery varies in different patients. All of them who recover, however, must be especially careful not to overdo, either in work or play or worry. A second attack is more readily acquired than the first and is harder to overcome.

Science News Letter, October 4, 1930

CHEMISTRY

Triorthocresyl Phosphate Brought Death in Drink

CONVINCING and final proof that technical triorthocresyl phosphate was the cause of thousands of cases of paralysis attributed to drinking Jamaica ginger has been announced by the U. S. Public Health Service.

Ginger itself is completely exonerated from the charges of causing the mysterious paralysis which broke out in southern and southwestern states early in the year. The Jamaica ginger drink which caused the paralysis was adulterated with the tricresyl phosphate. Ginger snaps, ginger bread and various other ginger delicacies need not be shunned for fear of the disease. The U. S. Public Health Service has no record of a single case of paralysis caused by ginger put out by a reputable pharmaceutical manufacturer.

The adulterant responsible for the paralysis is a relative of carbolic acid. It is widely used in trade circles in the manufacture of varnishes, shellacs, etc. It is cheap and easily obtainable and was probably used because its physical characteristics make it hard to distinguish from normal ginger constituents.

Science News Letter, October 4, 1930

Nature Ramblings

By FRANK THONE

ZOOLOGY

Kangaroo Rats

IT IS rather a pity that the Norway rat has made himself such an impudent nuisance, and even such a menace to health and life. For he has brought into disrepute a whole host of respectable and even attractive rodents who share the name he has made a byword and a reproach.

There are, for example, the kangaroo rats. We ordinarily think of the method of locomotion by leaping on the hind legs as a device invented and monopolized by certain groups of the marsupials of Australia. But as a matter of fact, there are many animals of other families elsewhere in the world that have found out for themselves that when danger threatens one good way to escape is to jump—jump far and quick.

And that is what the kangaroo rat does. He does not ordinarily go leaping about in hops many times his own body length, but when he doesn't like the sound or smell of his neighborhood, he is off—and no dog or snake can prophesy in which direction or how far. He is like his big Australian namesake, too, in that he uses his long tail as a third member of the supporting tripod. His tail, unlike that of the kangaroo, ends in a bushy tuft of hairs.

There are several species of kangaroo rats in America, all of them outdoor dwellers, and there are a number of smaller rodents as well, which are usually classified as "kangaroo mice." And on the other side of the equation, there are in Australia certain kangaroo-like creatures so small that they are usually called "mouse-kangaroos."

Science News Letter, October 4, 1930

Recent tests indicate that taking narcotics affects the body very much like a blow on the head; in both cases nerve cells become thick and white and cease to function.

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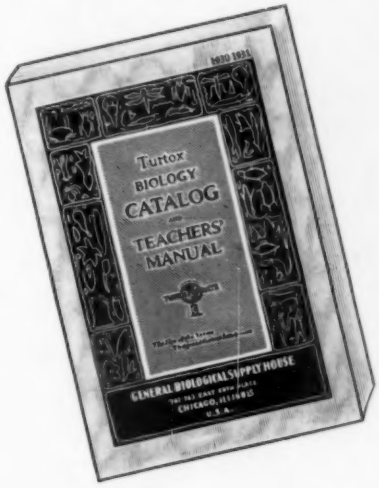

1930-1931 Edition

Although the 1929-30 edition of this book was written primarily for the High School teacher, it met with an unexpectedly large demand in colleges, normal schools and universities. Many university teachers even requested extra copies for distribution to their advanced students who planned to teach Biology after finishing their school work.

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Physics

THE ATOM—G. P. Thomson—*Holt,* 252 p., $1.25. With the great changes that have come in recent years regarding our knowledge of the atom and how it is made, there has been an urgent need for a small and popular work summarizing these views. Professor Thomson, who recently spent a year at Cornell as exchange professor, is himself one of the pioneers who contributed this new knowledge and is also the son of a still earlier pioneer in the same field, Sir J. J. Thomson. Therefore he speaks with authority and in addition has the ability of expressing himself clearly in popular language, so that this little book admirably fills the gap. It is one of the publisher's always excellent "Home University Library."

Science News Letter, October 4, 1930

History-Ethnology

THE MAKERS OF CIVILIZATION IN RACE AND HISTORY—L. A. Waddell—*Luzac, London,* 646 p., 28s. To show the scope of this work, we cannot do better than quote Dr. Waddell's own explanatory subtitle: "Showing the rise of the Aryans of Sumerians, their origination and propagation of civilization, their extension of it to Egypt and Crete, personalities and achievements of their kings, historical originals of mythic gods and heroes, with dates from the rise of civilization about 3380 B. C., reconstructed from Babylonian, Egyptian, Hittite, Indian and Gothic sources." Like Elliot Smith, the author stresses the importance of diffusion of ideas in the development of Old World culture. Unlike Professor Smith, he regards the Nordics of Mesopotamia as the pioneers of that culture. The volume is attractively illustrated, and brings together a great deal of the latest source material.

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Psychology

PSYCHOLOGIES OF 1930—24 authors, edited by Carl Murchison—*Clark University Press,* 497 p., $6. Again, as in the Psychologies of 1925, Dr. Murchison has gathered together an interesting list of leading psychologists and has set these 23 men—and one woman—to expounding the current problems and trends in their science. Many and varied schools are represented, including the configurational psychologies of Germany; the Russian psychologies, expounded by Pavlov, Schniermann and Kornilov; analytical psychologies discussed by Janet, Adler and Flugel; the factor school and its famous "g" explained by Spearman; as well as chapters on dynamic psychology by Woodworth, behaviorism by Hunter and Weiss, reaction psychology by Dunlap and other doctrines discussed by other writers. The new volume covers a broader ground than its predecessor and reassures us that the "Psychologies" appearing from time to time are likely to become an institution.

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Prophecy

THE WORLD IN 2030 A. D.—The Right Honourable The Earl of Birkenhead—*Brewer and Warren,* 215 p., $3. The delightful times in store for our descendants, who will work one day per week and spend the rest of their time "liberating atomic energy," fox-hunting (though social parasitism among *women* will be unknown), and making war with super-tanks which will also swim, dive and fly. P. S.—India will still be loyal to the Empire.

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Education—General Science

SCIENCE IN EDUCATION, ITS AIMS AND METHODS—Henry H. Cawthorne—*Oxford University Press,* 110 p., $2. This little book is dedicated, rather apprehensively it seems, "To the Child, who is fast becoming the last concern in secondary education." The teacher of natural science who opens the book at this page has caught the point of view of the author, for he is primarily concerned with the problem of presenting science to boys and girls in such a way as to attain the high goal—"the best results." The author stresses the point that he presents a choice of methods, and that one of the dangers in science education is that teachers go on teaching as they were taught themselves.

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Horticulture

MODERN ROSES—J. Horace McFarland—*Macmillan,* 284 p., $5. Over 2,500 varieties of roses are described in this "Who's Who." It has taken fifteen years to gather material for this comprehensive catalogue compiled under the auspices of the American Rose Society. The result is a handbook invaluable to anyone who grows roses for pleasure or profit. In addition to the rose list, an appendix gives the originators of roses referred to in the list.

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Astronomy

ASTRONOMY—John Charles Duncan *Harper,* 435 p., $3.75. Here is the latest of the numerous astronomical texts that have appeared in the last few years. It is also one of the best and that it has achieved a well-deserved popularity is shown by the fact that this is the second edition, the first having been issued in 1926. Dr. Duncan, who is professor of astronomy at Wellesley, but who spends the summers at Mt. Wilson making photographs with the 100-inch telescope, is one of the most eminent of present-day astronomers, so that he writes with an authority emphasized by the numerous illustrations consisting of his own photographs of celestial bodies. In addition, as an experienced teacher, he writes in a clear and interesting manner, that makes even more vital this always interesting subject. The second edition has given the opportunity for some extensive revision, one of the most striking items being a full description of the discovery of Pluto, this being the first text to mention the trans-Neptunian planet by name. A new set of some excellent and convenient star maps has been introduced, and other advances in astronomical knowledge in the last four years have been incorporated. In response to a demand from teachers, exercises have been introduced at the end of each chapter, but they are designed to stimulate rather than merely to review the work. In short, though written as a text, it can be recommended as the best single book available today for the general reader who wishes to learn more about the heavens above him.

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Psychology

THE CHILD FROM ONE TO SIX—Ada Hart Arlitt—*McGraw-Hill,* 188 p., $2. A rubber book shelf will soon be needed to hold the books on the care of young children. Here is the newest and one of the best for school and home guidance. It is written so simply and readably that the busiest of parents will find it possible to pick it up and read a page, or even a paragraph, anywhere in the book—with profit. Besides the usual subjects of training children into good habits of eating, sleeping, obeying, and controlling their emotions, there are valuable chapters on "Your child's imagination" and "How your child thinks."

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